Definitions—Flood Stage & Flood Severity Categories

National Weather Service Des Moines, Iowa
February 7, 2012

References

- NWS Directives (NWSI) 10-950 (Hydro definitions and general terminology), http://www.nws.noaa.gov/directives/sym/pd01009050curr.pdf .

All below definitions are taken from NWSI 10-950 (hydro definitions and general terminology.)

Important note: the below definitions pertaining to Flood Stage, Moderate Flood Stage and Major Flood Stage are intended only for impacts owing to overland flooding (i.e., water flowing on top of the land), not from effects owing to seepage or the water table rising (e.g., seepage from behind a levee or flooded basements due to the water table rising).

River reach / gage reach

The **river reach or gage reach** is defined as:

> *A section of river or stream between an upstream and downstream location, for which the stage or flow measured at a point somewhere along the section (e.g., gaging station or river forecast point) is representative of conditions in that section of river or stream.*

Bankfull Stage

Bankfull Stage is defined as:

> *An established gage height at a given location along a river or stream, above which a rise in water surface will cause the river or stream to overflow the lowest natural stream bank somewhere in the corresponding reach. The term "lowest bank" is, however, not intended to apply to an unusually low place or a break in the natural bank through which the water inundates a small area. Bankfull Stage is not necessarily the same as Flood Stage.*

Flood Stage

Flood Stage is defined as:

> *An established gage height for a given location at which a rise in water surface level begins to create a hazard to lives, property, or commerce. The issuance of flood (or in some cases*

flash flood) warnings is linked to Flood Stage. Flood Stage is not necessarily the same as Bankfull Stage.

Notes:

1. Flood Stage applies to the entire reach of the river, not just the immediate vicinity of the river gage. The Flood Stage for a given gaging site may be set such that impacts meeting Flood Stage criteria are not being met in the immediate vicinity of the gaging site, but are being met elsewhere within the gage's reach.
2. Flood Stage can be subjective. Regardless, Flood Stage should ultimately be the stage at which significant impacts begin to life and property within the gage's reach.
3. Flood Stage is not necessarily the same as Bankfull Stage. Flood Stage refers to significant impacts on life and property, whereas Bankfull Stage refers to the physical characteristics of the stream.
4. If a levee is built like a dam (i.e., very secure) then the Flood Stage can be much higher than the ground outside the levee (i.e., water would have to flow over the levee to flood). If the levee is poorly built (i.e., not very secure), then the Flood Stage should be defined as if the levee was not there.
5. Ideally, at any given gaging site, Flood Stage should be reached or exceeded approximately once every 2 to 5 years, or the 50% to 20% annual chance flood. Please note—this is only a rule of thumb. Sometimes the Flood Stage is higher or lower, depending on impacts within the gage's reach. Keep in mind that this rule of thumb is based only on statistics, and not the actual flood impacts which would take precedence over the statistics.

Flood Severity Categories

Flood severity categories, as defined below for each river forecast point, describe the severity of flood impacts in the corresponding river reach. The first three of these flood categories—minor, moderate, and major flooding—are bounded by an upper and lower stage. The severity of flooding at a given stage is not necessarily the same at all locations along a river reach due to varying channel and bank characteristics or the presence of levees. Therefore, the upper and lower stages for a given flood category are usually associated with water levels corresponding to the most significant flood impacts somewhere in the reach.

Minor Flooding is defined as:

Minimal or no property damage, but possibly some public threat.

Moderate Flooding is defined as:

Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations.

Major Flooding is defined as:

Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

Record Flooding is defined as:

Flooding which equals or exceeds the highest stage or discharge observed at a given site during the period of record keeping. The highest stage on record is not necessarily above the other three flood categories – it may be within any of them or even less than the lowest.

Notes:

1. All three of the lower flood categories (i.e., minor, moderate, major) do not necessarily exist for a given river forecast point. For example, at the level where a river reaches Flood Stage, it may be considered moderate flooding. However, at least one of these three flood categories must start at Flood Stage. At NWS Des Moines, however, nearly all river forecast points have defined minor, moderate and major flood categories.
2. Flood Stage does not have to be set where minor flooding starts. In other words, minor flooding can be set lower than Flood Stage. It is a common misconception that Flood Stage has to be set at where minor flooding starts. At NWS Des Moines, however, minor flooding is typically set to begin at Flood Stage.

Forecast Issuance Stage

Forecast Issuance Stage is defined as:

The stage which, when reached by a rising stream, represents the level where River Forecast Centers (RFCs) need to begin issuing forecasts for a non-routine (flood-only) river forecast point. This stage is coordinated between WFO and RFC personnel and is not necessarily the same as action or alert stage. The needs of WFO/RFC partners and other users are considered in determining this stage.

Notes:

1. At NWS Des Moines, Forecast Issuance Stage is typically the same as Action Stage.
2. Forecast Issuance Stage is the stage at which river forecasts begin appearing on our public AHPS Web pages.

3. Typically, Forecast Issuance Stage is set 1 to 3 feet below Flood Stage. The actual difference between Forecast Issuance Stage and Flood Stage can vary by more than 1 to 3 feet, however, depending on local user circumstances or needs.

—*Prepared by Jeffrey Zogg, Senior Hydrologist/NWS Des Moines, IA*